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Supplemental Material

Prenatal Exposure to Air Pollution and Pre-Labor Rupture of Membranes in a Prospective Cohort Study: The Role of Maternal Hemoglobin and Iron Supplementation

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Supplement Table 1 The general characteristics of the study population during 2015 to 2021 in Hefei [n (%)]

Characteristics	Included (n = 6824)	Excluded (n=2496)	*P* value [a]
Sociodemographic characteristics, n (%)			
Age, years			0.281
<25	1666 (24.4)	647 (25.9)	
25–34	4476 (65.6)	1595(63.9)	
≥35	682 (10.0)	254 (10.2)	
Education			0.159
Junior high school	941 (13.8)	382 (15.3)	
High school	1655 (24.3)	583 (23.4)	
Bachelor's degree and above	4228 (62.0)	1531 (61.3)	
Family income, RMB/month			0.220
≤3999	2149 (31.5)	753 (30.2)	
4000–7999	4132 (60.6)	1521 (60.9)	
≥8000	543 (8.0)	222 (8.9)	
Parity			0.170
Primipara	2611 (38.3)	994 (39.8)	
Multipara	4213 (61.7)	1502 (60.2)	
Season of delivery			0.003
Spring	1756 (25.7)	658 (27.3)	
Summer	1800 (26.4))	635 (26.3)	
Autumn	1730 (25.4)	605 (25.1)	
Winter	1538 (22.5)	515 (21.3)	
missing	0	83	
Enrollment years			0.063
2015-2016	2420(35.5)	831(33.3)	
2017-2018	2534(37.1)	989 (39.6)	
2019-2021	1870(27.4)	676 (27.1）	
Perinatal health lifestyle factors, n (%) [b]			
Vegetable intake, times/week			0.887
< 3	231 (3.4)	83 (3.3)	
≥ 3	6593 (96.6)	2413 (96.7)	
Fruit intake, times/week			0.203
< 3	470 (6.9)	191 (7.7)	
≥ 3	6354 (93.1)	2305 (92.3)	
Dessert intake, times/week			0.915
< 3	5633 (82.5)	2058(82.5)	
≥ 3	1191 (17.5)	438 (17.5)	
Physical activity, days/week			0.525
< 3	5394 (79.0)	1988 (79.6)	
≥ 3	1430 (21.0)	508(20.4)	
Folic acid supplementation, days/week			0.869
< 3	4387(64.3)	1600 (64.1）	
≥ 3	2437(35.7)	896 (35.9)	
Iron supplementation, days/week			0.180
< 3	5847(85.7)	2111 (84.6)	
≥ 3	977(14.3)	385 (15.4)	
Passive smoking			0.056
Never	5598(82.0)	2090(83.8)	
Ever	1226(18.0)	406(16.2)	
Perinatal health status, n (%)			
Pre-pregnancy BMI, kg/m^2			0.042
< 18.5	985 (14.4)	373 (14.9)	
18.5–23.9	4816 (70.6)	1722 (69.0)	
≥ 24.0	1023 (15.0)	400(16.2)	
Hypertension during pregnancy	139(2.0)	55(2.2)	0.650

Vaginitis	783 (11.5)	269 (10.8)	0.346
Gestational diabetes mellitus			0.495
Yes	1424 (20.9)	532(21.5)	
No	5400 (79.1)	1940 (78.5)	
Missing	0	24	
Premature birth	229 (3.4)	102 (4.1)	0.114
Maternal anemia	2290 (33.6)	882 (35.3)	0.109

PROM: pre-labor rupture of membranes.

[a] Based on the chi-square test.

[b] The frequency of vegetable intake, fruit intake, dessert intake , physical activtty was duing second trimester. The frequency of folic acid supplementation intake was duing first trimester. The frequency of iron supplementation was during the third trimester.

Supplement Table 2 Correlations of air pollution in the prenatal period

Pollutions	First trimester				Second trimester				Third trimester			
	$PM_{2.5}$	**PM_{10}**	**CO**	**SO_2**	**$PM_{2.5}$**	**PM_{10}**	**CO**	**SO_2**	**$PM_{2.5}$**	**PM_{10}**	**CO**	**SO_2**
First trimester												
$PM_{2.5}$	1.00	0.94	0.92	0.74	0.13	0.25	0.02	0.24	,0.65	,0.53	,0.43	,0.18
P-value		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
PM_{10}		1.00	0.89	0.83	0.12	0.21	0.07	0.30	,0.52	,0.42	,0.28	,0.38
P-value			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
CO			1.00	0.83	0.41	0.52	0.32	0.51	,0.46	,0.34	,0.28	0.01
P-value				<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.344
SO_2				1.00	0.31	0.37	0.36	0.59	,0.17	,0.09	0.05	0.28
P-value					<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Second trimester												
$PM_{2.5}$					1.00	0.93	0.91	0.73	0.19	0.26	0.02	0.19
P-value						<0.001	<0.001	<0.001	<0.001	<0.001	0.043	<0.001
PM_{10}						1.00	0.86	0.79	0.11	0.17	0.01	0.20
P-value							<0.001	<0.001	<0.001	<0.001	0.388	<0.001
CO							1.00	0.84	0.48	0.56	0.35	0.50
P-value								<0.001	<0.001	<0.001	<0.001	<0.001
SO_2								1.00	0.38	0.42	0.41	0.62
P-value									<0.001	<0.001	<0.001	<0.001
Third trimester												
$PM_{2.5}$									1.00	0.92	0.90	0.72
P-value										<0.001	<0.001	<0.001
PM_{10}										1.00	0.83	0.77
P-value											<0.001	<0.001
CO											1.00	0.83
P-value												<0.001

Correlations were calculated using Spearmon's correlation coefficient.

Supplement Table 3

The PROM risk in association with week-specific prenatal air pollution exposure during pregnancy [a]

Gestational weeks	PM2.5 [b]		PM10 [b]		SO2 [b]		CO [b]	
	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)	OR	(95%CI)
Week 1	0.985	0.961,1.010	1.022	1.001,1.043	1.025	0.965,1.091	0.996	0.972,1.023
Week 2	0.993	0.971,1.013	1.013	0.993,1.034	1.018	0.962,1.081	1.006	0.980,1.030
Week 3	0.999	0.978,1.021	1.007	0.987,1.028	1.015	0.962,1.076	1.012	0.987,1.036
Week 4	1.003	0.983,1.027	1.002	0.982,1.023	1.015	0.963,1.075	1.016	0.991,1.040
Week 5	1.004	0.986,1.030	0.999	0.979,1.019	1.018	0.967,1.078	1.018	0.993,1.043
Week 6	1.004	0.987,1.031	0.998	0.977,1.018	1.023	0.972,1.083	1.019	0.995,1.043
Week 7	1.003	0.987,1.030	0.997	0.976,1.017	1.030	0.978,1.090	1.019	0.995,1.044
Week 8	1.003	0.987,1.029	0.997	0.977,1.018	1.039	0.985,1.100	1.020	0.995,1.044
Week 9	1.003	0.988,1.029	0.999	0.978,1.019	1.048	0.992,1.110	1.020	0.995,1.044
Week 10	1.006	0.989,1.030	1.000	0.979,1.021	1.058	1.000,1.121	1.021	0.996,1.045
Week 11	1.009	0.990,1.033	1.003	0.981,1.024	1.067	1.008,1.133	1.023	0.997,1.047
Week 12	1.013	0.993,1.037	1.005	0.984,1.027	1.077	1.016,1.144	1.025	0.998,1.050
Week 13	1.018	0.995,1.042	1.008	0.987,1.030	1.087	1.023,1.155	1.027	1.000,1.053
Week 14	1.024	0.998,1.048	1.012	0.990,1.033	1.096	1.030,1.165	1.030	1.003,1.057
Week 15	1.029	1.001,1.054	1.015	0.993,1.036	1.104	1.036,1.175	1.033	1.005,1.062
Week 16	1.033	1.003,1.060	1.018	0.996,1.039	1.111	1.041,1.183	1.036	1.008,1.066
Week 17	1.037	1.006,1.065	1.021	0.998,1.042	1.117	1.045,1.190	1.039	1.010,1.069
Week 18	1.040	1.008,1.069	1.023	1.001,1.045	1.122	1.049,1.196	1.042	1.012,1.072
Week 19	1.042	1.010,1.072	1.025	1.003,1.048	1.125	1.051,1.200	1.044	1.015,1.075
Week 20	1.043	1.011,1.074	1.027	1.005,1.050	1.127	1.053,1.203	1.046	1.017,1.077
Week 21	1.044	1.013,1.074	1.029	1.007,1.051	1.128	1.053,1.204	1.048	1.018,1.077
Week 22	1.044	1.014,1.074	1.030	1.009,1.053	1.127	1.053,1.203	1.048	1.019,1.077
Week 23	1.044	1.015,1.073	1.030	1.009,1.053	1.125	1.052,1.201	1.048	1.020,1.077
Week 24	1.043	1.016,1.072	1.031	1.010,1.054	1.122	1.049,1.198	1.048	1.020,1.075
Week 25	1.042	1.016,1.070	1.030	1.010,1.053	1.118	1.046,1.194	1.046	1.020,1.072
Week 26	1.041	1.016,1.067	1.029	1.010,1.053	1.113	1.043,1.189	1.043	1.018,1.069
Week 27	1.039	1.015,1.065	1.028	1.009,1.052	1.108	1.039,1.183	1.040	1.016,1.064
Week 28	1.037	1.013,1.061	1.027	1.008,1.050	1.101	1.034,1.176	1.036	1.013,1.060
Week 29	1.034	1.010,1.058	1.025	1.007,1.049	1.095	1.030,1.170	1.031	1.010,1.055
Week 30	1.031	1.007,1.055	1.023	1.005,1.047	1.088	1.025,1.164	1.028	1.006,1.051
Week 31	1.028	1.004,1.052	1.021	1.003,1.045	1.083	1.021,1.159	1.025	1.002,1.048
Week 32	1.026	1.002,1.050	1.019	1.001,1.042	1.078	1.018,1.155	1.023	0.999,1.046
Week 33	1.025	1.001,1.050	1.017	0.999,1.040	1.074	1.015,1.152	1.022	0.997,1.047
Week 34	1.027	1.002,1.052	1.015	0.997,1.038	1.071	1.014,1.152	1.024	0.998,1.051
Week 35	1.031	1.006,1.057	1.013	0.995,1.036	1.071	1.014,1.155	1.029	1.000,1.057
Week 36	1.036	1.010,1.062	1.012	0.993,1.035	1.073	1.016,1.161	1.034	1.006,1.064

Week 37	1.039	1.013,1.065	1.011	0.991,1.034	1.079	1.020,1.171	1.039	1.012,1.067

[a] The PROM risk in association with week-specific prenatal air pollution exposure during pregnancy

[b] The per increase in $PM_{2.5}$ and PM_{10} was 10 μg/m^3, the per increase in SO_2 was 5 μg/m^3, and the per increase in CO was 0.1 mg/m^3. Models were based on a distributed lag (non-linear) model and adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, and temperature.

Supplement Table 4

Cumulative effects and average effects between air pollutant exposure and PROM risk in Distributed Lag Model and logistic regression model. (unadjusted models)

Pollutions	Mean	SD	*OR* (95%*CI*) for PROM [d]	
			Distributed lag model	Average exposure model
First trimester				
$PM_{2.5}$(ug/m^3) [a]	57.7	18.6	1.02(0.99,1.05)	1.01(0.98,1.04)
PM_{10}(ug/m^3) [a]	87.0	17.0	1.02(0.98,1.06)	1.03(0.99,1.10)
SO_2(ug/m^3) [b]	17.8	4.9	1.09(1.02,1.15)	1.05(0.99,1.11)
CO (mg/m^3) [c]	0.9	0.2	1.04(1.01,1.08)	1.04(0.99,1.07)
Second trimester				
$PM_{2.5}$(ug/m^3) [a]	54.6	18.1	1.06(1.10,1.13)	1.06(1.03,1.09)
PM_{10}(ug/m^3) [a]	84.1	16.3	1.09(1.05,1.13)	1.09(1.05,1.26)
SO_2(ug/m^3) [b]	12.1	4.4	1.15(1.08,1.23)	1.15(1.09,1.21)
CO (mg/m^3) [c]	0.9	0.2	1.08(1.04,1.12)	1.08(1.04,1.12)
Third trimester				
$PM_{2.5}$(ug/m^3) [a]	54.0	19.0	1.06(1.03,1.09)	1.04(1.01,1.08)
PM_{10}(ug/m^3) [a]	82.2	16.9	1.06(1.03,1.10)	1.05(1.01,1.09)
SO_2(ug/m^3) [b]	11.5	4.2	1.15(1.07,1.24)	1.14(1.09,1.19)
CO (mg/m^3) [c]	0.9	0.2	1.06(1.03,1.09)	1.07(1.03,1.11)
Second and third trimester				
$PM_{2.5}$(ug/m^3) [a]	54.2	15.1	1.10(1.05,1.14)	1.09(1.05,1.13)
PM_{10}(ug/m^3) [a]	83.2	13.5	1.13(1.08,1.18)	1.12(1.07,1.17)
SO_2(ug/m^3) [b]	11.8	4.0	1.16(1.07,1.25)	1.20(1.10,1.25)
CO (mg/m^3) [c]	0.9	0.2	1.10(1.05,1.14)	1.11(1.07,1.15)

PROM: pre-labor rupture of membranes.

[a] per increase in10 μg/m^3, [b] per increase in 5 μg/m^3, [c] per increase in 0.1 mg/m^3

[d] Estimated by distributed lag models using weekly mean exposures, and by mean air pollution during specific exposure windows (average exposure model).

Supplement Table 5 Cumulative effects and average effects between air pollutant exposure and PROM risk in Distributed Lag Model and logistic regression model after adjusting the trimester.

Pollutions	Mean	SD	*OR* (95%*CI*) of PROM [d,]	
			Distributed Lag Model [e]	Average Exposure Model [f]
First trimester				
$PM_{2.5}$(ug/m^3) [a]	57.7	18.6	1.01 (0.98,1.04)	1.02 (0.99,1.05)
PM_{10}(ug/m^3) [a]	87.0	17.0	1.02 (0.98 1.05)	1.02 (0.98,1.05)
SO_2(ug/m^3) [b]	17.8	4.9	1.06 (0.98,1.16)	1.07 (0.98,1.17)
CO (mg/m^3) [c]	0.9	0.2	1.03 (0.99,1.07)	1.04 (1.00,1.07)
Second trimester				
$PM_{2.5}$(ug/m^3) [a]	54.6	18.1	1.11 (1.04,1.19)	1.12 (1.07,1.17)
PM_{10}(ug/m^3) [a]	84.1	16.3	1.14 (1.07,1.22)	1.15 (1.10,1.21)
SO_2(ug/m^3) [b]	12.1	4.4	1.13 (1.03,1.24)	1.19 (1.11,1.28)
CO (mg/m^3) [c]	0.9	0.2	1.09(1.03,1.14)	1.12 (1.08,1.14)
Third trimester				
$PM_{2.5}$(ug/m^3) [a]	54.0	19.0	1.04 (1.01,1.08)	1.05 (1.02,1.08)
PM_{10}(ug/m^3) [a]	82.2	16.9	1.05 (1.01,1.09)	1.06 (1.02,1.10)
SO_2(ug/m^3) [b]	11.5	4.2	1.14 (1.05,1.25)	1.13 (1.05,1.21)
CO (mg/m^3) [c]	0.9	0.2	1.06 (1.02,1.10)	1.07 (1.03,1.11)
Second and third trimesters				
$PM_{2.5}$(ug/m^3) [a]	54.2	15.1	1.13 (1.06,1.22)	1.08(1.03,1.13)
PM_{10}(ug/m^3) [a]	83.2	13.5	1.18 (1.10,1.27)	1.11(1.06,1.17)
SO_2(ug/m^3) [b]	11.8	4.0	1.16 (1.06,1.28)	1.16(1.07,1.25)
CO (mg/m^3) [c]	0.9	0.2	1.10 (1.04,1.15)	1.09(1.04,1.14)

PROM: pre-labor rupture of membranes.

[a] per increase in10 μg/m^3, [b] per increase in 5 μg/m^3, [c] per increase in 0.1 mg/m^3

[d] Estimated by distributed lag models using weekly mean exposures, and by mean air pollution during specific exposure windows (average exposure model).

[e] The models were adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, temperature.

[f] The models were adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, temperature. And air pollution in the other two trimesters.

Supplement Table 6 Association of prenatal air pollution exposure with the term PROM and preterm PROM

Pollutions	Mean	*SD*	*OR* (95%*CI*) [d]	
			Term PROM(n=1328)	Preterm PROM(n=111)
First trimester				
$PM_{2.5}$(ug/m^3) [a]	57.7	18.6	1.01 (0.98,1.04)	0.88 (0.64,1.21)
PM_{10}(ug/m^3) [a]	87.0	17.0	1.03 (0.99,1.10)	0.85 (0.68,1.06)
SO_2(ug/m^3) [b]	17.8	4.9	1.05 (0.99,1.11)	0.93 (0.85,1.01)
CO (mg/m^3) [c]	0.9	0.2	1.03 (0.99,1.07)	0.86 (0.68,1.09)
Second trimester				
$PM_{2.5}$(ug/m^3) [a]	54.6	18.1	1.14 (1.07,1.22)	1.01 (0.98,1.03)
PM_{10}(ug/m^3) [a]	84.1	16.3	1.17 (1.10,1.26)	1.01 (0.98,1.03)
SO_2(ug/m^3) [b]	12.1	4.4	1.15 (1.05,1.26)	0.86 (0.68,1.09)
CO (mg/m^3) [c]	0.9	0.2	1.11 (1.06,1.17)	1.07 (0.76,1.49)
Third trimester				
$PM_{2.5}$(ug/m^3) [a]	54.0	19.0	1.04 (1.01,1.08)	1.01 (0.98,1.03)
PM_{10}(ug/m^3) [a]	82.2	16.9	1.05 (1.01,1.09)	1.09 (0.78,1.56)
SO_2(ug/m^3) [b]	11.5	4.2	1.13 (1.04,1.23)	0.97 (0.88,1.07)
CO (mg/m^3) [c]	0.9	0.2	1.07 (1.03,1.11)	1.02 (0.71,1.48)
Second and third trimesters				
$PM_{2.5}$(ug/m^3) [a]	54.2	15.1	1.13 (1.05,1.23)	1.01 (0.71,1.45)
PM_{10}(ug/m^3) [a]	83.2	13.5	1.21 (1.13,1.29)	1.09 (0.78,1.56)
SO_2(ug/m^3) [b]	11.8	4.0	1.20 (1.09,1.32)	0.98 (0.90,1.07)
CO (mg/m^3) [c]	0.9	0.2	1.12 (1.05,1.19)	0.95 (0.66,1.35)

PROM: pre-labor rupture of membranes.

[a] per increase in10 μg/m^3, [b] per increase in 5 μg/m^3, [c] per increase in 0.1 mg/m^3

[d] The models were adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, temperature, and air pollutant in other two trimesters.

Supplement Table 7 Association of air pollution exposure and PROM in co-pollutant models [a]

Models	PROM	
	Adjusted *OR* [b]	95%*CI*
$PM_{2.5}$		
Single-model	1.08	(1.03,1.13)
+SO_2	1.08	(1.01,1.06)
+CO	1.11	(1.01,1.22)
PM_{10}		
Single-model	1.11	(1.06,1.17)
+SO_2	1.02	(1.01,1.03)
+CO	1.16	(1.02,1.31)
SO_2		
Single-model	1.16	(1.07,1.25)
+$PM_{2.5}$	1.03	(1.01,1.05)
+PM_{10}	1.01	(0.98,1.04)
CO		
Single-model	1.09	(1.04,1.14)
+$PM_{2.5}$	1.03	(1.00,1.06)
+PM_{10}	1.08	(1.03,1.13)

PROM: pre-labor rupture of membranes.

[a] Air pollution was in the second and third trimesters. The per increase in $PM_{2.5}$ and PM_{10} was 10 μg/m^3, the per increase in SO_2 was 5 μg/m^3, and the per increase in CO was 0.1 mg/m^3.

[b] Models was adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, and temperature.

Supplement Table 8 The estimated change in hemoglobin levels in third trimester was calculated for each quartile and each unit increment in $PM_{2.5}$, PM_{10}, SO_2, and CO during the second and third trimesters using linear regression model.[a]

Pollutants and Quartile of Concentration	Hemoglobin	
	β [b]	95% *CI*
$PM_{2.5}$, μg/m³		
Quartile 1 (<41.3)	0.00	—
Quartile 2 (41.4–52.8)	-3.29	(-4.12, -2.46)
Quartile 3 (52.9–66.4)	-3.62	(-2.46, -2.83)
Quartile 4 (≥66.5)	-4.03	(-4.92, -3.14)
Continuous (per 10 μg/m³)	-0.94	(-1.15, -0.73)
PM10, μg/m³		
Quartile 1 (<72.5)	0.00	—
Quartile 2 (72.6–82.4)	-2.58	(-3.36, -1.80)
Quartile 3 (82.5–92.2)	-3.92	(-4.83, -3.01)
Quartile 4 (≥92.3)	-4.62	(-5.43, -3.80)
Continuous (per 10 μg/ m³)	-1.31	(-1.55, -1.07)
SO2, μg/m³		
Quartile 1 (<7.2)	0.00	—
Quartile 2 (7.3–11.9)	-4.08	(-4.85, -3.30)
Quartile 3 (12.0–14.9)	-4.62	(-5.38, -3.86)
Quartile 4 (≥15.0)	-5.09	(-5.88, -4.30)
Continuous (per 5 μg/m³)	-2.96	(-3.32, -2.61)
CO, mg/m³		
Quartile 1 (<0.794)	0.00	—
Quartile 2 (0.795-0.896)	-4.59	(-5.35, -3.82)
Quartile 3 (0.897–1.033)	-5.86	(-6.66, -5.06)
Quartile 4 (≥1.034)	-6.78	(-7.54, -6.01)
Continuous (per 0.1 mg/m³)	-1.11	(-1.31, -0.92)

[a] The estimated change in hemoglobin levels in third trimester was calculated for each quartile and each unit increment in $PM_{2.5}$, PM_{10}, SO_2, and CO during the second and third trimesters.

[b] The model was based on the line regression model and adjusted for age, education, income, activity, passive smoking, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, and temperature.

β (per 1 g/L)

Supplement Table 9 Association of air pollution exposure and hemoglobin levels in co-pollutant models [a]

Model	Hemoglobin	
	β [b]	**(95%*CI*)**
$PM_{2.5}$		
Single-model	-0.94	(-1.15, -0.73)
+SO_2	0.31	(-3.49, 1.67)
+CO	-0.91	(-1.04, -0.77)
PM_{10}		
Single-model	-1.31	(-1.55, -1.07)
+SO_2	-2.92	(-3.47, -2.38)
+CO	-2.45	(-2.86, -1.67)
SO_2		
Single-model	-2.96	(-3.32, -2.61)
+$PM_{2.5}$	-2.58	(-3.49, -1.67)
+PM_{10}	-2.61	(-3.52, -1.70)
CO		
Single-model	-1.11	(-1.31, -0.92)
+$PM_{2.5}$	-0.82	(-0.93, -0.71)
+PM_{10}	-0.91	(-1.04, -0.77)

[a] Air pollution was in the second and third trimesters. The per increase in $PM_{2.5}$ and PM_{10} was 10 μg/m^3, the per increase in SO_2 was 5 μg/m^3, and the per increase in CO was 0.1 mg/m^3.

[b] Models was adjusted for age, education, income, parity, activity, passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, and temperature.

β (1 unit g/L)

Supplement Table 10 The relationship between hemoglobin levels and PROM risk in logistic models.

Hemoglobin (g/L)	PROM	
	OR	**95% *CI***
<100	2.44	(1.73, 3.46)
100-104	2.42	(1.72, 3.41)
105-109	2.40	(1.73, 3.34)
110-114	1.97	(1.42, 2.73)
115-119	1.77	(1.27, 2.45)
120-124	1.72	(1.23, 2.42)
125-129	1.52	(1.05, 2.21)
≥130	1.00[a]	—

PROM: pre-labor rupture of membranes.

The relationship between hemoglobin levels in third trimester and PROM. The model was based on the logistic regression model and adjusted for age, education, income, parity, activity, active and passive smoking folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, and temperature.

[a] Reference group

Supplement Table 11 Correlation matrix eigenvalues of multiple air pollutants model on second to third trimester and corresponding eigenvector

Principal component	**Correlation matrix eigenvalue**			**Corresponding eigenvector**			
	Eigenvalue	Contribution rate	Accumulated Contribution rate	$PM_{2.5}$	PM_{10}	SO_2	CO
PC1	3.615	90.38	90.38	0.956	0.970	0.899	0.975
PC2	0.277	6.93	97.31	-0.209	-0.134	0.423	-0.002

PC1: First principal component
PC2: Second principal component

Supplement Table 12 The association between iron supplementation and PROM risk stratified by air pollution levels in anemia women

Pollutions [a]	Exposure level	Iron supplementation, days/week	*N*	Hemoglobin	PROM		
				M±*SD*, g/L	%	Unadjusted OR (*95%CI*)	Adjusted OR (*95%CI*) [d]
$PM_{2.5}$	<P75[f]	≥ 3	711	114.5±10.6 [b]	17.9 [c]	0.70(0.51,0.98)	0.69(0.49,0.98)
		< 3	1141	112.0±11.0	19.5	0.78(0.58,1.06)	0.78(0.56,1.08)
	≥P75	≥ 3	129	111.5 ±9.1	21.7	0.90(0.55,1.47)	0.88 (0.53,1.46)
		< 3	309	110.8±10.1	23.6	1.00[e]	1.00 [e]
PM_{10}	<P75	≥ 3	700	114.5±10.5 [b]	17.7 [c]	0.62(0.45,0.85)	0.64(0.45,0.91)
		< 3	1127	112.0±11.0	19.9	0.73(0.53,1.01)	0.75(0.55,1.01)
	≥P75	≥ 3	140	111.9±9.7	22.1	0.76(0.46,1.25)	0.75(0.46,1.25)
		< 3	323	108.0±10.0	22.0	1.00 [e]	1.00 [e]
CO	<P75	≥ 3	740	114.6±10.2 [b]	18.1 [c]	0.72(0.54,0.95)	0.59(0.43,0.81)
		< 3	1143	112.4±10.9	18.6	0.79(0.61,1.02)	0.58(0.32,1.04)
	≥P75	≥ 3	100	110.1±10.7	21.0	0.93(0.65,1.34)	0.73(0.42,1.27)
		< 3	307	108.1±10.0	22.7	1.00 [e]	1.00 [e]
SO_2	<P75	≥ 3	732	114.6±10.2 [b]	18.3 [c]	0.69(0.49,0.97)	0.70(0.50,0.98)
		< 3	1144	112.2±10.9	19.1	0.74(0.54,1.02)	0.73(0.53,1.00)
	≥P75	≥ 3	108	110.3±11.0	19.4	0.72(0.41,1.25)	0.73(0.42,1.27)
		< 3	306	110.0±10.0	24.8	1.00 [e]	1.00 [e]

PROM: pre-labor rupture of membranes. [a] Air pollution was in the second and third trimesters.

[b] P for trend of hemoglobin levels across four groups was < 0.001, < 0.001, < 0.001, < 0.001, respectively.

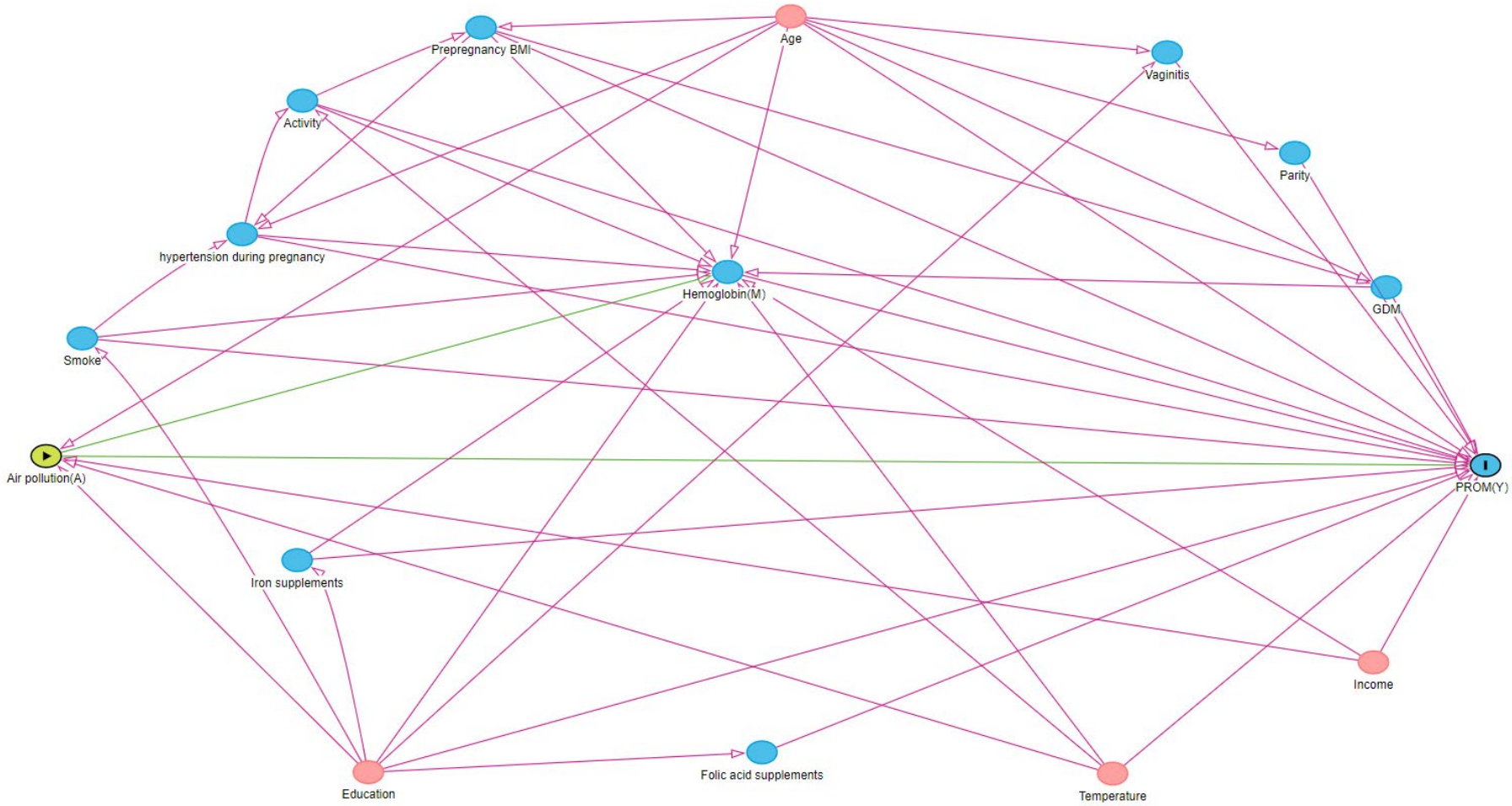
[c] P for the trend of PROM across four groups was0.023, 0.022, 0.042, 0.002, respectively..

The test for P-trend was performed using general linear regression model and Mantel-Haenszel chi-square test in hemoglobin levels and PROM prevalence across above four groups.

[d] Models adjusted for age, education, income, parity, activity, active and passive smoking, folic acid supplementation, iron supplementation, pre-pregnancy BMI, hypertension during pregnancy, gestational diabetes mellitus, vaginitis, and temperature.

[e] Reference group

[f] The 75th percentile for the exposure during second and third trimester was 66.5 μg/m^3 for $PM_{2.5}$, 92.3μg/m^3 for PM_{10}, 14.9μg/m^3 for SO_2, 1.03 mg/m^3 for CO, respectively.



Supplement Figure 1 Directed acyclic graph for the association between air pollution exposure and PROM
GDM: Gestational diabetes mellitus, PROM: pre-labor rupture of membranes.
(A): exposure, (M): mediator, (Y): outcome